filtration through sand impregnated with vegetable growth, and after adding algæ to the water, the nitrites are increased. The growth of larvæ in a water is as a rule accompanied by an increase of nitrites, though the nitrification does not seem to be increased on the addition of either ammonium salts or nitrates to the water, or on fouling the water by animal excretions.

The arm-lengths of the larvæ are not specially affected by vegetable growth, though by water filtered through sand impregnated with algæ and diatoms they are somewhat diminished. They are considerably increased on development of the larvæ in water purified by being kept in darkness, and in aërated water. They are greatly diminished in water previously heated to 100°, but not in that heated to from 50° to 77°. In water exposed to sunlight they are also diminished. They are increased in water fouled by most animals and by dead Echinoids, but in that fouled by living Echinoids are diminished.

During a period of seven months the specific gravity of the Aquarium water was found to vary from 1·02859 to 1·02964 at 15·56° C. The specific gravity was on an average about 0·00040 greater than that of the open sea water. The free ammonia varied from 0·185 to 0·350 milligram per litre, and the albuminoid from 0·111 to 0·182 milligram.

Report of the Kew Observatory Committee for the Year ending December 31, 1897.

The operations of The Kew Observatory, in the Old Deer Park, Richmond, Surrey, are controlled by the Kew Observatory Committee, which is constituted as follows:—

Mr. F. Galton, *Chairman.*

Captain W. de W. Abney, C.B., R.E.
Prof. W. G. Adams.
Captain E. W. Creak, R.N.
Prof. G. C. Foster.
Prof. J. Perry.
The Earl of Rosse, K.P.

Prof. A. W. Rücker.
Mr. R. H. Scott.
Mr. W. N. Shaw.
Lieut.-General Sir R. Strachey, G.C.S.I.
Rear Admiral Sir W. J. L. Wharton, K.C.B.

The work at the Observatory may be considered under the following heads:—

1st. Magnetic observations.
2nd. Meteorological observations.
3rd. Solar observations.
4th. Experiments and Researches in connexion with any of the departments.
5th. Verification of instruments.
6th. Rating of Watches and Marine Chronometers.
7th. Miscellaneous.

I. MAGNETIC OBSERVATIONS.

The Magnetographs have been in constant operation throughout the year, and the usual determinations of the Scale Values were made in January.

The ordinates of the various photographic curves representing Declination, Horizontal Force, and Vertical Force were then found to be as follows:—

Declinometer: 1 inch = 0° 22′·04. 1 cm. = 0° 8′·7.

Bifilar, January 20, 1897, for 1 inch δH = 0·0280 foot grain unit.
,, 1 cm. ,, = 0·00051 C.G.S. unit.
Balance, January 21, 1897, for 1 inch δV = 0·0274 foot grain unit.
,, 1 cm. ,, = 0·00050 C.G.S. unit.

During the past year the magnetic curves have been free from any very large fluctuations. The principal variations that were recorded took place on the following days:—

January 2; February 4, 25—27; March 9—10; April 2, 20, 23—24; May 17; June 16—17; July 31; October 1—2, 28; November 17; December 11, 20—21.

The hourly means and diurnal inequalities of the magnetic elements for 1897, for the quiet days selected by the Astronomer Royal, will be found in Appendix I.

In the present year a correction has been applied for the diurnal variation of temperature, use being made of the records from a Richard thermograph as well as the eye observations of a thermometer placed under the Vertical Force shade.

The mean values at the noons preceding and succeeding the selected quiet days are also given, but these of course are not employed in calculating the daily means or inequalities.

The following are the mean results for the entire year:—

Mean Westerly Declination	17° 6′·4.
Mean Horizontal Force............	0·18342 C.G.S. unit.
Mean Inclination	67° 19′·6.
Mean Vertical Force	0·43906 C.G.S. unit.

Observations of Absolute Declination, Horizontal Intensity, and Inclination have been made weekly, as a rule.

As in 1896, a table of recent values of the Magnetic Elements at the Observatories whose publications are received at Kew was contributed to 'Science Progress,' and appeared in the August number. A similar table, but containing more recent data, will be found in Appendix IA to the present Report.

In July, M. Moureaux, of the Parc Saint-Maur Observatory, near Paris, paid a visit, and a comparison was made of his and the Kew magnetic instruments, a detailed report of which has been drawn up by the Superintendent, and published in the Royal Society's Proceedings, vol. 62, p. 156.

The magnetic instruments lent to the Jackson-Harmsworth Polar Expedition have been returned, and in October some observations were taken with them by Mr. Albert Armitage, the Magnetic Observer in the expedition, and the Observatory Staff, with a view to standardizing the Arctic Observations.

Dr. van Rijckevorsel spent some time at the Observatory, in March and April, comparing his magnetic instruments with the Kew unifilar and dip circle.

Information on matters relating to various magnetic data have been supplied to Dr. E. Atkinson, Professor Arnold Lupton, and Captain Schück, and the latter gentleman compared his instruments with the Observatory standards.

II. METEOROLOGICAL OBSERVATIONS.

The several self-recording instruments for the continuous registration of Atmospheric Pressure, Temperature of Air and Wet-bulb, Wind (direction and velocity), Bright Sunshine, and Rain, have been maintained in regular operation throughout the year, and the standard eye observations for the control of the automatic records duly registered.

The tabulations of the meteorological traces have been regularly made, and these, as well as copies of the eye observations, with notes of weather, cloud, and sunshine, have been transmitted, as usual, to the Meteorological Office.

With the sanction of the Meteorological Council, data have been supplied to the Council of the Royal Meteorological Society, the Institute of Mining Engineers, and the editor of 'Symons' Monthly Meteorological Magazine.'

On June 21, observations with the Campbell sunshine recorder, of the original wooden bowl pattern, were suspended, by direction of the Meteorological Council.

Electrograph.—The auxiliary battery of 60 chloride of silver cells used with this instrument was received back from the makers on January 11.

Before restarting the instrument, the Clifton Quadrant Electrometer was taken entirely to pieces, all parts thoroughly cleaned and dried, and new sulphuric acid put in the inner jar.

The battery was tested, each row of cells being examined and the voltage determined.

The electrograph was started on January 19, and has been in constant operation since, with the exception of one or two short stoppages due to freezing of the water jet, or other accidental causes. Owing presumably to the changes introduced last year, there has been a great improvement in the behaviour of the apparatus. There are still, however, one or two directions in which further improvement is desirable.

On September 29, one-third of the cells in the battery were taken off, to make a corresponding contraction in the scale values, which was expedient in view of the high potentials usually recorded during the winter months.

Notwithstanding this, several hours' record have been lost owing to the trace being off the sheet. It is difficult at present to see how such loss can be avoided, without either duplicating part at least of the apparatus, so as to get two curves, one showing ordinary and the other extraordinary potentials (positive and negative), or else by risking possible loss of negative trace by shifting the position, on the sheet, of the zero line.

The scale value was determined, by direct comparison with the Portable Electrometer, White, No. 53, on January 19, May 4, and on September 29, before and after the change above referred to.

The comparisons showed that up to the date of the change the scale value had remained practically constant.

Inspections.—In compliance with the request of the Meteorological Council, the following Observatories and Anemograph Stations have been visited and inspected:—Fleetwood, Stonyhurst, Armagh, Dublin, Valencia, Falmouth, and St. Mary's (Scilly Isles), by Mr. Baker; Radcliffe Observatory (Oxford), Yarmouth, North Shields, Alnwick Castle, Fort William, Glasgow, Aberdeen, and Deerness (Orkney), by Mr. Constable.

III. SOLAR OBSERVATIONS.

Sun-spots.—Sketches of Sun-spots have been made on 165 days, and the groups numbered, after Schwabe's method.

Particulars will be found in Appendix II, Table IV.

Taking into consideration the elaborate photographic work now done elsewhere, the Committee consulted the Solar Physics Committee and other eminent astronomers on the subject, with the result that they decided that the eye observations should cease at the end of 1897.

IV. EXPERIMENTAL WORK.

Fog and Mist.—The observations of a series of distant objects, referred to in previous Reports, have been continued. A note is taken of the most distant of the selected objects which is visible at each observation hour.

Atmospheric Electricity.—The comparisons of the potential, at the point where the jet from the water-dropper breaks up, and at a fixed station on the observatory lawn, mentioned in last year's Report, have been continued, and the observations have been taken nearly every month.

A comparison of these observations with the corresponding results from the electrograms encourages the belief that there has been no progressive change of insulation in the electrograph, such as was met with prior to the late alterations and improvements.

Advantage was taken of the occurrence of some very thick fogs in November, to carry out six sets of observations of the potential at various heights from the ground to 70 feet above.

Aneroid Barometers.—The experiments referred to last year have been continued, and a considerable number of interesting conclusions have been arrived at. It is hoped that the results will be ready for publication in the course of the present year.

Platinum Thermometry.—In accordance with the arrangement alluded to in last year's Report, Dr. J. A. Harker came to the Observatory in January to do some work in platinum thermometry. The authorities of the International Bureau of Weights and Measures at Sèvres having consented with the greatest readiness and courtesy to a comparison by Dr. Harker, in their laboratories, of the scales of the hydrogen and platinum thermometers, the Committee decided to do all in their power to make the scheme successful. It had been from the first the hope of the Committee that platinum thermometry would prove a valuable auxiliary in direct comparison of mercury thermometers, especially at temperatures outside the range 0° to 100° C., and the opportunity of a comparison with the standard gas thermometer of the Bureau International thus occurred very opportunely.

After Dr. Harker's arrival at Kew it was found that somewhat extensive alterations would be required to fit the existing resistance box for the work at Sèvres, and it also appeared undesirable that the Observatory should be deprived for some months of the means of using platinum thermometers. A new resistance box was accordingly ordered from Messrs. Crompton & Co., embodying the alterations suggested by the experience of Dr. Harker and the Observatory staff. On its completion, this box was taken to Sèvres by Dr. Harker in July, together with two or three of the platinum thermometers previously in use at the Observatory, and some new ones of higher resistance. Since then Dr. Harker has been engaged on the proposed research in co-operation with Dr. Chappuis of the International Bureau. It is expected that the investigation, so far as practicable at present, will be concluded in a few months.

The inconsistencies in the behaviour of the Callendar-Griffiths resistance box, referred to last year, having been proved to arise principally from the uncertainties of the plugs, it was sent to the makers (the Cambridge Scientific Instrument Company) for readjustment. They made use of the opportunity to introduce, at their own expense, a new system of plugs. In it the plugs are isolated, so that manipulating one leaves the tightness of the others unaffected. Another source of trouble proved to be thermo-electric currents generated in the patent thermo-electric key; the key accordingly has been enclosed, at the suggestion of Mr. W. N. Shaw, in a box, and the defect though still existent appears much reduced.

Experiments have been continued on the fixity of zero of platinum thermometers and the degree of consistency in the results obtained with them. Further attention has also been given to the comparison of platinum and mercury thermometers at high temperatures. This is a subject of increasing urgency in view of repeated requests for direct high temperature verifications which cannot as yet be satisfactorily dealt with.

Mercury Thermometry.—To assist in perfecting a method of high temperature verifications, some high range thermometers of the Jena glasses 16^{III} and 59^{III} have been ordered from Berlin. They are to be verified at the Reichsanstalt before delivery.

At the request of Messrs. Powell & Sons, Whitefriars, experiments are being made as to the thermometric properties of different kinds of glass. Particulars of the chemical composition of the glass will be published, with the results obtained, when the experiments are completed.

An apparatus for the comparison of meteorological maximum and minimum thermometers in the horizontal position has been designed by Mr. Casella, and is at present under construction.

V. VERIFICATION OF INSTRUMENTS.

The subjoined is a list of the instruments examined in the year 1897, with the corresponding results for 1896:—

	Number tested in the year ending December 31.	
	1896.	1897.
Air-meters	5	5
Anemometers	12	3
Aneroids	113	77
Artificial horizons	21	17
Barometers, Marine	84	167
,, Standard	72	101
,, Station	40	30
Binoculars	455	661
Compasses	3	51
Deflectors	—	4
Hydrometers	374	292
Inclinometers	8	5
Photographic Lenses	14	10
Magnets	4	2
Navy Telescopes	546	707
Rain Gauges	17	27
Rain Measuring Glasses	26	31
Scales	1	—
Sextants	591	694
Sunshine Recorders	2	10
Theodolites	5	29
Thermometers, Avitreous, or Immisch's	7	5
,, Clinical	13,772	17,270
,, Deep sea	74	119
,, High Range	52	37
,, Hypsometric	34	30
,, Low Range	62	71
,, Meteorological	4,098	2,874
,, Solar radiation	2	—
,, Standard	69	117
Unifilars	3	4
Vertical Force Instruments	—	4
Declinometers	—	3
Total	20,566	23,457

Duplicate copies of corrections have been supplied in 85 cases.

The number of instruments rejected in 1896 and 1897 on account of excessive error or for other reasons was as follows :—

	1896.	1897.
Thermometers, clinical	161	156
,, ordinary meteorological	56	38
Sextants	79	98
Telescopes	30	66
Binoculars	—	28
Various	43	56

Two Standard Thermometers have been constructed during the year.

There were at the end of the year in the Observatory undergoing verification 12 Barometers, 680 Thermometers, 24 Sextants, 12 Telescopes, 10 Binoculars, 20 Hydrometers, and 3 Sunshine Recorders.

VI. Rating of Watches and Chronometers.

The high standard of excellence to which attention was drawn in last year's Report has been maintained. Although the number of marks obtained by the watch standing first on the list is slightly lower than last year, yet the general average is as good, and no less than 108 movements have obtained the highest possible form of certificate (the class A especially good), which involves the attainment of 80 per cent. of the total marks.

The 680 watches received were entered for trial as below :—

For class A, 492 ; class B, 144 ; class C, 16 ; and 28 for the subsidiary trial. Of these 17 passed the subsidiary test, 161 failed from various causes to gain any certificate ; 7 were awarded class C certificates, 109 class B, and 386 class A.

In Appendix III will be found a table giving the results of trial of the first 51 watches which gained the highest number of marks during the year. The highest place was taken by Messrs. Usher and Cole, of London, with a keyless going-barrel, Karrusel lever-watch, No. 29,106, which obtained 88·4 marks out of a maximum of 100.

The class C trial having been of late years but little called for, the Committee decided early in the year to suspend the further issue of class C certificates, and this rule came into operation on April 1.

The number of watches obtaining the class A certificate "especially good" having during the past few years largely increased, considerations of space forbid the publication of the rates and marks of all of them. Attention was drawn to this proposed change in the Report for 1896.

Appendix III embraces watches gaining 82·5 marks and upwards, the remaining 57, which obtained the distinction "especially good," ranging from 82·3 to 80·0 marks.

Various representations having been made that changes are desirable in the system of marks and in the dating of certificates, a circular has been issued to ascertain the general opinion of watch manufacturers and others interested in the matter.

Marine Chronometers.—During the year, 65 chronometers have been entered for the Kew A and B trials; of these 49 gained certificates, and 16 failed to pass.

The present box for the "cold" test of chronometers proving inadequate, it is intended during the winter of 1897–98 to fit up a larger and much improved chamber to hold a considerable number of movements. This, it is expected, will remove much of the difficulty and expense of maintaining the low temperature of 45° during the summer months.

The relay of the chronograph working in circuit with the standard mean-time clock "French" having proved rather uncertain in its action during the latter part of May, it was decided to have the entire apparatus overhauled. This was carried out in June by Messrs. E. Dent & Co., and an improved relay and new armatures were fitted. It has since performed well. During the interval the time signals were recorded on a galvanometer (P.O. pattern).

VII. MISCELLANEOUS.

Paper.—Prepared photographic paper has been supplied to the Observatories at Hong Kong, Mauritius, St. Petersburg, Toronto, Oxford (Radcliffe), and Stonyhurst, and through the Meteorological Office to Aberdeen, Batavia, Fort William, and Valencia.

Anemograph and Sunshine Sheets have also been sent to Hong Kong and Mauritius, and *papier Saxe* to Coimbra, and a number of Campbell-Stokes sunshine recorders to St. Petersburg. At the request of the India Office, a drum chronograph with best frictional governors, to be used for astronomical and transit work, was made by Messrs. Thomas Cook and Sons, of York, and, after erection and examination at Kew, was forwarded to the Colaba Observatory, Bombay.

Exhibition at the Crystal Palace.—Specimens of the curves from the various self-recording apparatus and cloud photographs were lent for exhibition at the Crystal Palace and safely returned.

Ships' Compasses.—With the kind assistance of Captain E. W. Creak, R.N., F.R.S., regulations have been laid down for the separate verification of old or additional cards for compass bowls previously tested.

Travellers' Azimuth Compasses.—After the conclusion of the special experiments mentioned last year, a report was submitted to the Royal Geographical Society.

Painting of the Building.—The whole exterior of the building was painted in April and May by H.M. Office of Works.

Seismograph.—An application for a grant of £60 for the purchase and erection of a seismograph was favourably entertained by the Government Grant Committee. The instrument has been ordered from Mr. R. Munro, but has not yet been delivered.

National Physical Laboratory Committee.—A committee having been appointed by Government "to consider and report upon the desirability of establishing a National Physical Laboratory for the testing and verification of instruments for physical investigation, for the construction and preservation of standards of measurement, and for the systematic determination of physical constant and numerical data useful for scientific and industrial purposes; and to report whether the work of such an institution, if established, could be associated with any testing or standardising work already performed wholly or partly at the public cost," the Chairman and the Superintendent gave evidence before it.

It is also proposed that the National Physical Laboratory Comitttee should visit Kew Observatory at an early date.

Library.—During the year the library has received publications from

21 Scientific Societies and Institutions of Great Britain and Ireland,
102 Foreign and Colonial Scientific Establishments, as well as from several private individuals.

The card catalogue has been proceeded with.

Audit, &c.—The accounts for 1897 have been audited by Mr. W. B. Keen, Chartered Accountant, on behalf of the Royal Society, and by Professor Perry on behalf of the Committee.

The balance sheet, with a comparison of the expenditure for the two years, 1896 and 1897, is appended.

PERSONAL ESTABLISHMENT.

The staff employed is as follows:—

C. Chree, Sc.D., F.R.S., Superintendent.
T. W. Baker, Chief Assistant.
E. G. Constable, Observations and Rating.
W. Hugo, Verification Department.
J. Foster " "
T. Gunter " "
W. J. Boxall " "
G. E. Bailey, Accounts and Library.
E. Boxall, Observations and Rating, and seven other Assistants.
A Caretaker and Housekeeper are also employed.

(Signed) W. GRYLLS ADAMS,
pro Chairman.

March 29, 1898.

Comparison of Expenditure during the Years 1896 and 1897.

Expenditure.	1896.			1897.			Increase.			Decrease.		
Administration :—	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Superintendent	500	0	0	500	0	0						
First Assistant	273	18	0	331	18	0	58	0	0			
Office	105	12	1	119	6	1	13	14	0			
Rent, Fuel, Lighting, &c.	88	13	3	88	9	2				0	4	1
Caretaker	68	18	0	70	4	6	1	6	6			
Incidental Expenses	149	18	2	113	2	3				36	15	11
	1186	19	6	1223	0	0	73	0	6	37	0	0
Normal Observatory :—												
Salaries—Observations, &c.	301	17	8	320	2	10	18	5	2			
Incidental Expenses	77	1	4	48	1	4				29	0	0
Prop. Adm. Expenditure	237	0	0	244	12	0	7	12	0			
Researches :—												
Salaries				110	0	0	110	0	0			
Purchase of Apparatus, &c.	153	6	1	209	11	1	56	5	0			
Prop. Adm. Expenditure	355	10	0	366	18	0	11	8	0			
Tests :—												
Salaries	812	3	6	898	11	6	86	8	0			
Incidental Expenses	189	14	11	203	0	6	13	5	7			
Prop. Adm. Expenditure	475	19	6	489	4	0	13	4	6			
Commissions :—												
Purchases for Colonial Institutions, &c.	185	6	3	398	18	2	213	11	11			
Prop. Adm. Expenditure	118	10	0	122	6	0	3	16	0			
Purchase of Stock	471	1	0							471	1	0
Gross Expenditure (showing an increase of £33 15*s.* 2*d.*).	3377	10	3	3411	5	5	533	16	2	500	1	0
Extraordinary Expenditure.												
Researches :—												
Salaries				110	0	0	110	0	0			
Purchase of Apparatus, &c.	150	4	2	206	0	7	55	16	5			
Commissions :—												
Purchases for Colonial Institutions, &c.	185	6	3	398	18	2	213	11	11			
Purchase of Stock	471	1	0							471	1	0
	806	11	5	714	18	9	379	8	4	471	1	0
Leaving for Ordinary Nett Expenditure (showing an increase of £125 7*s.* 10*d.*).	2570	18	10	2696	6	8	154	7	10	29	0	0

Kew Observatory. Account of Receipts and Payments for the year ending December 31st, 1897.

RECEIPTS.

	£	s.	d.	£	s.	d.
To Balance from Year 1896				130	1	2
Royal Society:—						
Gassiot Trust. Annual payment	444	1	4			
,, ,, Income Tax returned	14	19	3			
				459	0	7
Meteorological Council:—						
Allowance	400	0	0			
Postages, &c.	13	11	11			
				413	11	11
Tests:—						
Verification	1695	6	10			
Rating	611	5	11			
Lenses	2	9	1			
				2309	1	10
Researches:—						
Government Grant Committee for purchase of Seismograph				60	0	0
Commissions executed for Colonial and Foreign Institutions, &c.				427	15	4
Rents				4	13	0
Dividends on India Stock				43	19	8
				£3848	3	6

PAYMENTS.

	£	s.	d.	£	s.	d.
By Normal Observatory:—						
Salaries—Observations, Tabulations, &c.	320	2	10			
Incidental Expenses, Photographic Paper, &c.	48	1	4			
Proportion of Administration Expenditure	244	12	0			
				612	16	2
Researches:—						
Salaries	110	0	0			
Purchase of Apparatus, &c.	209	11	1			
Proportion of Administration Expenditure	366	18	0			
				686	9	1
Tests:—						
Salaries	898	11	6			
Incidental Expenses—Apparatus, &c.	203	0	6			
Proportion of Administration Expenditure	489	4	0			
				1590	16	0
Commissions:—						
Purchase of Instruments and Photographic Paper for Colonial and Foreign Institutions, &c.	398	18	2			
Proportion of Administration Expenditure	122	6	0			
				521	4	2
Balance—In London and County Bank	396	1	7			
Awaiting Banking	20	8	6			
In hand (Petty Cash)	20	8	0			
				436	18	1
				£3848	3	6

ADMINISTRATION EXPENDITURE.

Particulars.	£	s.	d.
Superintendent	500	0	0
First Assistant, Librarian, &c.	451	4	1
Rent, Fuel, &c.	88	9	2
Caretaker, Repairs, &c.	183	6	9
	£1223	0	0

Apportionment.	£	s.	d.
Observatory	244	12	0
Researches	366	18	0
Tests	489	4	0
Commissions	122	6	0
	£1223	0	0

Audited on behalf of the Royal Society and found correct,
18th of January, 1898.
(Signed) W. B. KEEN, *Chartered Accountant.*

On behalf of the Committee, supervised and approved,
19th January, 1898.
(Signed) JOHN PERRY.

ESTIMATED ASSETS.

	£	s.	d.	£	s.	d.
By Balance as per Statement				436	18	1
£1300 India 3½ per cent. Stock, value on January 1, 1898				1521	0	0
Payments due:—						
Meteorological Council—Allowance, Postages, &c.	100	9	10			
Test Fees	606	13	8			
Commissions	168	6	0			
				875	9	6
Stock:—						
Blank Forms and Certificates	61	14	5			
Standard Thermometers	76	12	0			
				138	6	5
				£2971	14	0

January 19th, 1898.

ESTIMATED LIABILITIES.

	£	s.	d.
To Administration accounts—Gas, Rent, Repairs, &c.	31	1	4
Observatory accounts—Photographic Paper, &c.	7	14	6
Tests accounts—Repairs, Apparatus, &c.	44	18	4
Commissions	124	3	3
Researches	14	17	11
Government Grant Committee for Seismograph	60	0	0
General Balance	2688	18	8
	£2971	14	0

(Signed) CHARLES CHREE,
Superintendent.

List of Instruments, Apparatus, &c., the Property of the Kew Observatory Committee, at the present date out of the custody of the Superintendent, on Loan.

To whom lent.	Articles.	Date of loan.
G. J. Symons, F.R.S.	Portable Transit Instrument................	1869
The Science and Art Department, South Kensington.	Articles specified in the list in the Annual Report for 1893........................	1876
Professor W. Grylls Adams, F.R.S.	Unifilar Magnetometer, by Jones, No. 101, complete..............................	1883
	Pair 9-inch Dip-Needles with Bar Magnets ...	1887
Lord Rayleigh, F.R.S.	Standard Barometer (Adie, No. 655)	1885
Radcliffe Observatory, Oxford.	Black Bulb Thermometer *in vacuo*	1897

APPENDIX I.

MAGNETICAL OBSERVATIONS, 1897.

Made at the Kew Observatory, Old Deer Park, Richmond, Lat. 51° 28′ 6″ N. and Long. $0^h\ 1^m\ 15^s{\cdot}1$ W.

The results given in the following tables are deduced from the magnetograph curves which have been standardised by observations of deflection and vibration. These were made with the Collimator Magnet K.C. I. and the Declinometer Magnet marked K.O. 90 in the 9-inch Unifilar Magnetometer by Jones.

The Inclination was observed with the Inclinometer by Barrow, No. 33, and needles 1 and 2, which are 3½ inches in length.

The Declination and Force values given in Tables I to VIII are prepared in accordance with the suggestions made in the fifth report of the Committee of the British Association on comparing and reducing Magnetic Observations.

The following is a list of the days during the year 1897 which were selected by the Astronomer Royal, as suitable for the determination of the magnetic diurnal inequalities, and which have been employed in the preparation of the magnetic tables :—

January	6, 9, 22, 23, 26.
February	2, 9, 17, 18, 20.
March	14, 15, 16, 18, 20.
April..............	3, 11, 12, 15, 22.
May	8, 9, 12, 16, 28.
June..............	8, 9, 10, 12, 30.
July	1, 9, 13, 18, 26.
August............	4, 5, 6, 24, 31.
September	13, 18, 19, 26, 28.
October............	5, 9, 13, 20, 21.
November	7, 8, 12, 23, 30.
December..........	8, 13 26, 27, 28.

Table I.—Hourly Means of the Declination, as determined from the

Hours	Preceding noon.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
		(17° +) West					Winter.						
1897. Months.	′	′	′	′	′	′	′	′	′	′	′	′	′
Jan. ..	11·4	7·9	8·0	8·2	8·4	8·3	8·2	8·2	8·0	7·8	7·8	8·9	10·2
Feb. ..	11·6	8·3	8·6	8·6	9·0	8·9	8·8	8·4	8·0	8·0	7·8	7·8	10·1
March.	11·6	6·8	6·9	7·2	7·1	7·0	6·8	6·9	6·1	4·7	4·7	6·2	8·7
Oct. ..	8·9	3·9	3·8	3·9	4·2	3·9	3·7	3·3	2·5	1·9	2·1	3·6	6·6
Nov. ..	7·2	3·0	3·2	3·7	3·9	4·3	3·8	3·7	3·7	3·6	3·6	4·5	5·9
Dec. ..	4·7	2·4	2·8	3·3	3·3	3·3	3·4	3·2	3·1	3·1	2·9	3·3	3·8
Means	9·2	5·4	5·6	5·8	6·0	6·0	5·8	5·6	5·2	4·9	4·8	5·7	7·6
							Summer.						
	′	′	′	′	′	′	′	′	′	′	′	′	′
April..	13·3	7·6	7·4	7·5	7·2	6·9	7·0	6·1	4·8	3·6	3·8	5·4	8·1
May ..	12·3	7·6	7·4	7·1	6·8	6·4	5·5	4·5	3·5	3·0	4·2	6·3	9·5
June ..	10·4	5·9	5·9	5·5	5·2	4·7	3·1	2·3	2·3	2·4	3·4	6·0	8·0
July ..	9·8	5·1	4·8	4·7	4·2	3·5	2·3	1·3	1·8	2·2	2·8	4·9	7·7
Aug. ..	9·8	4·2	4·3	4·3	4·1	3·8	3·0	2·2	1·6	2·0	2·9	5·1	7·7
Sept. ..	9·5	3·4	3·2	3·3	3·2	2·7	3·6	3·2	2·7	2·2	3·1	4·5	6·5
Means	10·8	5·6	5·5	5·4	5·1	4·7	4·1	3·3	2·8	2·6	3·4	5·4	7·9

Table II.—Diurnal Inequality of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Summer Means.						
	′ −0·7	′ −0·8	′ −0·9	′ −1·2	′ −1·7	′ −2·3	′ −3·1	′ −3·6	′ −3·8	′ −3·0	′ −1·0	′ +1·6
						Winter Means.						
	′ −1·0	′ −0·8	′ −0·6	′ −0·4	′ −0·4	′ −0·6	′ −0·8	′ −1·2	′ −1·5	′ −1·6	′ −0·7	′ +1·2
						Annual Means.						
	′ −0·9	′ −0·8	′ −0·8	′ −0·8	′ −1·1	′ −1·4	′ −1·9	′ −2·4	′ −2·7	′ −2·3	′ −0·8	′ +1·4

NOTE.—When the sign is + the magnet

selected quiet Days in 1897. (The Mean for the Year = 17° 6′·4 West.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.	Succeeding noon.
Winter.													
′	′	′	′	′	′	′	′	′	′	′	′	′	′
11·1	11·5	10·2	9·4	9·5	9·5	9·0	8·5	8·1	7·9	7·6	7·9	8·0	11·8
11·4	12·0	11·9	11·3	10·2	10·0	9·6	9·5	9·0	8·5	8·2	8·0	8·1	12·2
12·0	13·6	13 9	12·5	10·7	8·9	8·3	7·7	7·8	7·9	7 6	7·1	7·0	12·0
7·9	8·1	7·7	6·5	5·2	4·9	4·8	4·2	4·1	3·8	3·4	3·7	3·6	8·5
6·8	7·2	6·3	5·6	5·4	5·3	4·6	4·3	4·0	3·2	2·7	2·8	2·8	7·6
4·5	4·6	3·8	3·8	3·7	3·3	3·0	2·8	2·6	2·5	2·2	2·5	2·5	4·6
9·0	9·5	9·0	8·2	7·5	7·0	6·6	6·2	5·9	5·6	5·3	5·3	5·3	9·5
Summer.													
′	′	′	′	′	′	′	′	′	′	′	′	′	′
11·6	13·7	13·5	12·0	10·5	9·1	8·1	7·8	8·1	8·2	8·1	7·9	7·5	12·5
12·1	12·5	11·9	10·0	8·6	7·7	7·4	7·4	7·4	7·4	7·4	7·1	7·1	11·9
9·8	10·5	10·5	9·9	8·7	7·8	7·4	7·0	6·8	6·8	6·6	5·8	5·5	10·9
9·7	10·6	10·4	9·7	8·1	6·7	5·6	6·0	5·9	5·6	5·8	5·3	5·1	10·4
10·3	11·5	11·2	9·6	7·7	6·2	5·2	4·9	5·0	5·1	4·9	4·8	4·6	10·4
8·3	9·1	8·9	8·2	7·0	6·4	6·4	5·7	4·9	4·7	4·4	4·4	3·8	9·1
10·3	11·3	11·1	9·9	8·4	7·3	6·7	6·5	6·4	6·3	6·2	5·9	5·6	10·9

Declination as deduced from Table I.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Summer Means.												
′	′	′	′	′	′	′	′	′	′	′	′	′
+4·0	+5·0	+4·7	+3·6	+2·1	+1·0	+0·4	+0·1	0·0	0·0	−0·1	−0·5	−0·7
Winter Means.												
′	′	′	′	′	′	′	′	′	′	′	′	′
+2·6	+3·1	+2·6	+1·8	+1·1	+0·6	+0·2	−0·2	−0·5	−0·8	−1·1	−1·1	−1·1
Annual Means.												
′	′	′	′	′	′	′	′	′	′	′	′	′
+3·3	+4·1	+3·7	+2·7	+1·6	+0·8	+0·3	0·0	−0·2	−0·4	−0·6	−0·8	−0·9

points to the west of its mean position.

Table III —Hourly Means of the Horizontal Force in C.G.S. units (corrected

(The Mean for the

Hours	Preceding noon.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	0 ·18000 +						Winter.						
1897. Months.													
Jan. ...	320	326	327	327	329	331	332	333	333	328	324	319	317
Feb. ...	324	335	335	334	334	335	336	335	336	334	330	326	325
March..	319	337	337	337	337	338	339	340	340	335	326	320	319
Oct. ...	332	350	348	347	347	349	349	349	346	340	333	328	330
Nov. ...	339	345	345	344	347	349	351	351	349	348	343	337	338
Dec. ...	346	347	348	347	351	353	355	355	354	355	354	349	346
Means..	330	340	340	339	341	342	344	344	343	340	335	330	329
							Summer.						
April...	300	331	331	331	329	331	333	336	331	325	316	307	302
May ...	331	345	345	344	345	344	343	340	334	328	324	322	325
June ...	332	350	349	348	348	348	345	341	337	333	329	331	331
July ...	329	354	354	352	351	351	349	346	341	334	329	323	325
Aug. ...	331	348	348	347	347	346	345	342	338	330	327	327	330
Sept. ...	341	358	358	358	357	357	357	356	353	346	339	336	340
Means..	327	348	347	347	346	346	345	343	339	333	327	324	325

Table IV.—Diurnal Inequality of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Summer Means.						
	+ ·00004	+ ·00003	+ ·00003	+ ·00002	+ ·00002	+ ·00001	− ·00001	− ·00005	− ·00011	− ·00017	− ·00020	− ·00019
						Winter Means.						
	·00000	·00000	− ·00001	+ ·00001	+ ·00002	+ ·00004	+ ·00004	+ ·00003	·00000	− ·00005	− ·00010	− ·00011
						Annual Means.						
	+ ·00002	+ ·00002	+ ·00001	+ ·00001	+ ·00002	+ ·00002	+ ·00002	− ·00001	− ·00006	− ·00011	− ·00015	− ·00015

Note.—When the sign is + the

for Temperature) as determined from the selected quiet Days in 1897.
Year = 0·18342.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.	Succeeding noon.
Winter.													
319	325	329	328	328	330	331	332	331	331	328	328	327	321
329	333	333	333	333	334	334	335	335	337	338	338	337	321
323	327	329	331	334	337	337	341	343	343	341	342	340	323
337	344	346	347	346	348	350	354	353	354	352	354	353	339
340	343	344	342	344	349	350	349	349	348	348	350	348	343
350	354	354	354	353	354	354	354	354	354	353	353	352	351
333	338	339	339	340	342	343	344	344	344	343	344	343	333
Summer.													
307	312	320	327	333	337	338	342	340	340	341	342	341	310
330	340	343	348	348	352	355	357	355	354	350	353	350	331
338	341	341	344	346	351	354	360	359	359	357	356	353	340
332	340	346	354	354	359	361	362	363	363	360	359	356	339
334	336	340	344	348	352	351	357	355	355	352	351	351	342
347	351	355	357	357	358	359	363	364	363	364	362	362	342
331	337	341	346	348	351	353	357	356	356	355	354	352	334

Horizontal Force as deduced from Table III.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Summer Means.												
− ·00013	− ·00007	− ·00003	+ ·00002	+ ·00004	+ ·00007	+ ·00009	+ ·00013	+ ·00012	+ ·00012	+ ·00011	+ ·00010	+ ·00008
Winter Means.												
− ·00007	− ·00002	− ·00001	− ·00001	·00000	+ ·00002	+ ·00003	+ ·00004	+ ·00004	+ ·00004	+ ·00003	+ ·00004	+ ·00003
Annual Means.												
− ·00010	− ·00005	− ·00002	·00000	+ ·00002	+ ·00005	+ ·00006	+ ·00008	+ ·00008	+ ·00008	+ ·00007	+ ·00007	+ ·00006

reading is above the mean.

Table V.—Hourly Means of the Vertical Force in C.G.S. units (corrected
(The Mean for the

Hours	Preceding noon.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	0·43000 +					Winter.							
1897. Months.													
Jan. ...	896	911	912	912	912	913	912	912	913	913	911	909	909
Feb. ...	928	925	925	926	926	926	926	925	925	924	923	920	918
March ..	937	948	948	947	947	946	946	946	946	946	943	938	933
Oct. ...	868	882	882	882	882	881	880	881	882	882	879	875	873
Nov. ...	883	887	886	886	885	885	886	885	885	885	885	884	883
Dec. ...	892	886	886	887	888	888	889	888	888	888	887	887	886
Means	902	906	906	907	907	906	906	906	906	906	905	902	900
						Summer.							
April ...	879	897	897	893	894	893	895	895	896	895	889	883	876
May ...	891	917	917	915	915	914	915	914	912	909	906	897	890
June ...	900	920	919	919	920	920	922	922	921	918	914	911	907
July ...	891	908	906	906	905	905	907	905	905	902	899	898	893
Aug. ...	896	914	915	915	914	914	916	917	916	914	907	901	898
Sept. ...	893	904	904	904	903	903	903	903	903	899	896	894	892
Means	892	910	910	909	908	908	910	909	909	906	902	897	893

Table VI.—Diurnal Inequality of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Summer Means.						
	+ ·00004	+ ·00003	+ ·00002	+ ·00002	+ ·00002	+ ·00003	+ ·00003	+ ·00002	·00000	− ·00005	− ·00009	− ·00014
						Winter Means.						
	·00000	·00000	·00000	·00000	·00000	·00000	·00000	·00000	·00000	− ·00002	− ·00004	− ·00006
						Annual Means.						
	+ ·00002	+ ·00002	+ ·00001	+ ·00001	+ ·00001	+ ·00002	+ ·00001	+ ·00001	·00000	− ·00003	− ·00007	− ·00010

Note.—When the sign is + the

for Temperature), as determined from the selected quiet Days in 1897.
Year = 0·43906.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.	Succeeding noon.
						Winter.							
910	911	916	916	915	915	915	915	914	914	913	913	912	918
921	923	929	932	933	932	931	929	928	926	925	923	924	912
933	933	939	946	950	952	951	951	950	950	949	949	949	926
875	878	880	883	884	883	883	883	883	883	882	880	879	875
886	887	890	892	892	891	889	889	889	890	888	888	888	879
886	887	888	888	888	888	888	887	887	886	887	887	887	875
902	903	907	909	910	910	909	909	908	908	907	906	906	898
						Summer.							
874	877	883	890	893	895	895	897	896	895	894	895	894	872
892	897	904	910	912	917	918	919	917	917	917	917	914	888
908	911	913	918	922	923	924	925	927	926	924	924	922	903
894	895	901	907	913	915	916	915	914	913	911	910	908	887
895	898	903	911	914	915	917	915	914	913	911	910	910	896
892	894	896	901	905	904	905	905	905	905	905	904	904	897
892	895	900	906	910	911	912	913	912	911	910	910	909	891

Vertical Force as deduced from Table V.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
						Summer Means.						
− ·00014	− ·00011	− ·00006	·00000	+ ·00003	+ ·00005	+ ·00006	+ ·00006	+ ·00006	+ ·00005	+ ·00004	+ ·00004	+ ·00002
						Winter Means.						
− ·00005	− ·00003	·00000	+ ·00003	+ ·00004	+ ·00004	+ ·00003	+ ·00003	+ ·00002	+ ·00002	+ ·00001	·00000	·00000
						Annual Means.						
− ·00009	− ·00007	− ·00003	+ ·00001	+ ·00003	+ ·00004	+ ·00004	+ ·00004	+ ·00004	+ ·00003	+ ·00002	+ ·00002	+ ·00001

reading is above the mean.

Table VII.—Hourly Means of the Inclination, calculated from the Horizontal

Hours	Preceding noon.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
		67° +					Winter.						
1897. Months.	′	′	′	′	′	′	′	′	′	′	′	′	′
Jan......	20·8	20·8	20·8	20·8	20·6	20·5	20·4	20·4	20·4	20·7	21·0	21·2	21·4
Feb.....	21·4	20·6	20·6	20·7	20·7	20·6	20·6	20·6	20·6	20·7	20·9	21·1	21·1
March..	22·0	21·1	21·1	21·1	21·1	21·0	20·9	20·9	20·9	21·2	21·7	22·0	21·9
Oct.....	19·2	18·4	18·6	18·6	18·6	18·5	18·4	18·5	18·7	19·1	19·5	19·7	19·5
Nov. ...	19·3	18·9	18·9	18·9	18·7	18·6	18·5	18·4	18·6	18·6	19·0	19·3	19·2
Dec.....	19·0	18·7	18·7	18·8	18·5	18·4	18·3	18·3	18·3	18·3	18·3	18·6	18·8
Means..	20·3	19·8	19·8	19·8	19·7	19·6	19·5	19·5	19·6	19·8	20·1	20·3	20·3
							Summer.						
	′	′	′	′	′	′	′	′	′	′	′	′	′
April...	21·7	20·1	20·1	20·0	20·1	20·0	19·9	19·7	20·1	20·4	20·9	21·3	21·5
May....	19·9	19·8	19·8	19·7	19·7	19·7	19·8	20·0	20·3	20·6	20·8	20·7	20·3
June ...	20·1	19·5	19·5	19·5	19·6	19·6	19·9	20·1	20·4	20·5	20·7	20·5	20·4
July....	20·1	18·9	18·8	19·0	19·0	19·0	19·2	19·3	19·7	20·0	20·3	20·6	20·4
Aug. ...	20·1	19·4	19·5	19·5	19·5	19·6	19·7	19·9	20·2	20·6	20·7	20·5	20·2
Sept. ...	19·3	18·5	18·5	18·5	18·5	18·5	18·5	18·6	18·8	19·2	19·5	19·7	19·4
Means..	20·2	19·4	19·4	19·4	19·4	19·4	19·5	19·6	19·9	20·2	20·5	20·6	20·4

Table VIII.—Diurnal Inequality of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Summer Means.						
	′ −0·1	′ −0·1	′ −0·1	′ −0·1	′ −0·1	′ 0·0	′ +0·1	′ +0·4	′ +0·7	′ +1·0	′ +1·1	′ +0·9
						Winter Means.						
	′ 0·0	′ 0·0	′ +0·1	′ −0·1	′ −0·2	′ −0·2	′ −0·2	′ −0·2	′ 0·0	′ +0·3	′ +0·6	′ +0·6
						Annual Means.						
	′ −0·1	′ −0·1	′ 0·0	′ −0·1	′ −0·2	′ −0·1	′ −0·1	′ +0·1	′ +0·4	′ +0·7	′ +0·8	′ +0·7

NOTE.—When the sign is +

and Vertical Forces (Tables III and V). (The Mean for the Year = 67° 19′·6.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.	Succeeding noon.
						Winter.							
′	′	′	′	′	′	′	′	′	′	′	′	′	′
21·3	20·9	20·8	20·8	20·8	20·7	20·6	20·5	20·6	20·6	20·7	20·7	20·8	21·3
20·9	20·7	20·9	20·9	21·0	20·9	20·8	20·7	20·7	20·5	20·4	20·4	20·5	21·2
21·6	21·4	21·4	21·5	21·4	21·2	21·2	21·0	20·8	20·8	20·9	20·8	21·0	21·5
19·1	18·7	18·6	18·6	18·7	18·6	18·4	18·2	18·2	18·2	18·3	18·1	18·1	19·0
19·2	19·0	19·0	19·2	19·1	18·7	18·6	18·7	18·7	18·8	18·7	18·6	18·7	18·8
18·5	18·3	18·3	18·3	18·3	18·3	18·3	18·3	18·3	18·3	18·4	18·4	18·4	18·2
20·1	19·8	19·8	19·9	19·9	19·7	19·6	19·6	19·6	19·5	19·6	19·5	19·6	20·0
						Summer.							
′	′	′	′	′	′	′	′	′	′	′	′	′	′
21·1	20·8	20·4	20·2	19·9	19·6	19·6	19·4	19·5	19·4	19·3	19·3	19·3	20·8
20·0	19·5	19·5	19·3	19·4	19·3	19·1	19·0	19·1	19·1	19·4	19·2	19·3	19·8
19·9	19·8	19·9	19·8	19·8	19·5	19·3	19·0	19·1	19·1	19·1	19·1	19·3	19·7
19·9	19·4	19·2	18·9	19·0	18·7	18·6	18·5	18·5	18·4	18·5	18·6	18·7	19·3
19·8	19·8	19·7	19·6	19·4	19·2	19·3	18·9	19·0	19·0	19·1	19·1	19·1	19·3
18·9	18·7	18·5	18·5	18·6	18·5	18·5	18·2	18·2	18·2	18·1	18·2	18·2	19·4
19·9	19·7	19·5	19·4	19·4	19·1	19·1	18·8	18·9	18·9	18·9	18·9	19·0	19·7

Inclination as deduced from Table VII.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
						Summer Means.						
′	′	′	′	′	′	′	′	′	′	′	′	′
+0·4	+0·2	0·0	−0·1	−0·1	−0·4	−0·4	−0·7	−0·6	−0·6	−0·6	−0·6	−0·5
						Winter Means.						
′	′	′	′	′	′	′	′	′	′	′	′	′
+0·3	+0·1	+0·1	+0·1	+0·1	0·0	−0·1	−0·2	−0·2	−0·2	−0·2	−0·3	−0·2
						Annual Means.						
′	′	′	′	′	′	′	′	′	′	′	′	′
+0·4	+0·1	+0·1	0·0	0·0	−0·2	−0·3	−0·4	−0·4	−0·4	−0·4	−0·4	−0·3

the reading is above the mean.

APPENDIX Ia.

Mean Values, for the years specified, of the Magnetic Elements at Observatories whose Publications are received at Kew Observatory.

Place.	Latitude.	Longitude.	Year.	Declination.	Inclination.	Horizontal Force. C. G. S. Units.	Vertical Force. C. G. S. Units.
Pawlowsk	59° 41′ N.	30° 29′ E.	1895	0° 15′·7 E.	70° 42′·4 N.	·16478	·47072
Katharinenburg	56 49 N.	60 38 E.	1895	9 43·3 E.	70 39·8 N.	·17808	·50750
Kasan	55 47 N.	49 8 E.	1892	7 30·8 E.	68 36·2 N.	·18551	·47345
Copenhagen	55 41 N.	12 34 E.	1894	10 41·3 W.	—	·17373	—
Stonyhurst	53 51 N.	2 28 W.	1896	18 31·2 W.	68 57·7 N.	·17202	·44726
Hamburg	53 34 N.	10 3 E.	1896	11 36·7 W.	67 38·8 N.	·18061	·43921
Wilhelmshaven	53 32 N.	8 9 E.	1896	12 46·8 W.	67 51·7 N.	·17994	·44229
Potsdam	52 23 N.	13 4 E.	1896	10 14·3 W.	66 38·4 N.	·18747	·43404
Irkutsk	52 16 N.	104 16 E.	1895	2 6·6 E.	70 11·1 N.	·20132	·55872
Utrecht	52 5 N.	5 11 E.	1895	14 15·5 W.	67 7·4 N.	·18435	·43691
Kew	51 28 N.	0 19 W.	1897	17 6·4 W.	67 19·6 N.	·18342	·43906
Greenwich*	51 28 N.	0 0	1896	16 56·5 W.	67 10·0 N. 67 9·3 N.	·18367	·43622 ·43598
Uccle (Brussels)	50 48 N.	4 21 E.	1896	14 32·5 W.	66 23·5 N.	·18925	·43300
Falmouth	50 9 N.	5 5 W.	1896	18 47·5 W.	67 5·0 N.	·18554	·43888
Prague	50 5 N.	14 25 E.	1896	9 25·5 W.	—	·19858	—
Parc St. Maur (Paris)	48 49 N.	2 29 E.	1895	15 9·4 W.	65 2·9 N.	·19664	·42263
Vienna	48 15 N.	16 21 E.	1894	8 43·6 W.	63 12·1 N.	·20740	·41061
O'Gyalla (Pesth)	47 53 N.	18 12 E.	1895	7 52·5 W.	—	·21080	—
Odessa†	46 26 N.	30 46 E.	1896	4 49·6 W.	62 33·9 N.	·22038	·42452
Pola	44 52 N.	13 51 E.	1896	9 41·7 W.	60 31·8 N.	·22061	·39042
Nice	43 43 N.	7 16 E.	1897	12 12·8 W.	60 15·4 N.	·22318	·39059
Toronto‡	43 40 N.	79 30 W.	1896	4 50·1 W.	—	·16645	—
Perpignan	42 42 N.	2 53 E.	1895	14 0·4 W.	60 8·5 N.	·22363	·38958
Rome	41 54 N.	12 27 E.	1891	10 45·1 W.	58 4·6 N.	·2324	·3730
Tiflis	41 43 N.	44 48 E.	1895	1 48·1 E.	55 47·0 N.	·25681	·37764
Capodimonte (Naples)	40 52 N.	14 15 E.	1893	9 47·0 W.	56 42·1 N.	—	—
Madrid	40 25 N.	3 40 W.	1895	16 6·6 W.	—	—	—
Coimbra	40 12 N.	8 25 W.	1895	17 42·0 W.	59 43·6 N.	·22581	·38685
Washington	38 55 N.	77 4 W.	1894	3 39·9 W.	70 34·3 N.	·19979	·56646
Lisbon	38 43 N.	9 9 W.	1895	17 39·1 W.	58 15·7 N.	·23344	·37731
Zi-ka-wei	31 12 N.	121 26 E.	1895	2 15·6 W.	45 55·1 N.	·32679	·33743
Hong Kong	22 18 N.	114 10 E.	1896	0 26·0 E.	31 41·3 N.	·36461	·22509
Colaba (Bombay)	18 54 N.	72 49 E.	1895	0 36·9 E.	20 48·5 N.	·37444	·14230
Manila	14 35 N.	120 58 E.	1896	0 51·0 E.	16 39·7 N.	·37868	·11333
Batavia	6 11 S.	106 49 E.	1896	1 22·0 E.	29 29·5 S.	·36768	·20795
Mauritius	20 6 S.	57 33 E.	1895	9 55·1 W.	54 37·1 S.	·23937	·33706
Melbourne	37 50 S.	144 58 E.	1896	8 15·0 E.	67 18·3 S.	·23392	·55936

* Of the two values of the Inclination and Vertical Force, the first is based on observations with 3-inch dip needles only, the second on combined observations with needles of 3, 6, and 9 inches.

† New *magnetic* observatory; only four last months' results available in 1896.

‡ Determinations of Inclination and Vertical Force suspended in course of 1896, owing to disturbing action of electric tramway.

APPENDIX II.—Table I.

Mean Monthly Results of Temperature and Pressure. Kew Observatory.
1897.

Months.	Thermometer.								Barometer.*					Mean vapour-tension.
	Mean.	Means of—			Absolute Extremes.				Mean.	Absolute Extremes.				
		Max.	Min.	Max. and Min.	Max.	Date.	Min.	Date.		Max.	Date.	Min.	Date.	
1897.	°	°	°	°	°	d. h.	°	d. h.	ins.	ins.	d. h.	ins.	d. h.	in.
Jan.	35·9	39·3	32·5	35·9	48·2	1 2 A.M.	23·8	18 8 & 9 A.M.	29·896	30·589	2 10 A.M.	29·213	30 2 P.M.	·181
Feb.	43·6	47·7	39·5	43·6	56·3	26 3 P.M.	28·1	18 3 „	30·113	30·659	16 11 „	29·173	2 7 & 8 A.M.	·246
March..	45·1	51·2	39·2	45·2	60·9	23 3 „	30·3	9 6 „	29·698	30·161	20 11 „ & NOON.	28·778	3 10 „	·238
April...	46·2	53·1	39·6	46·4	66·9	27 5 „	28·3	11 7 „	29·866	30·301	15 11 P.M.	28·997	1 7 „	·238
May ...	51·5	60·6	42·8	51·7	72·1	18 NOON.	33·7	13 3 „	29·978	30·437	15 11 „ & MIDT. 16 0·5 A.M.	29·343	27 5 P.M.	·265
June ...	61·1	69·6	52·7	61·2	84·0	24 1 P.M.	44·6	10 4 „	30·028	30·344	12 8 „	29·447	18 3 „	·401
July ...	63·6	72·6	55·0	63·8	80·1	24 3 „	43·6	8 4 „	30·021	30·387	11 8 „	29·577	20 2 „	·402
Aug. ...	62·5	71·5	54·8	63·2	87·7	4 2 „	48·0	13 4 „	29·844	30·249	3 10 „	29·501	8 2 „	·418
Sept....	55·2	62·0	48·2	55·1	68·3	29 3 „	38·8	19 5 „	30·006	30·531	13 9 „	29·409	1 MIDT.	·347
Oct.....	50·2	57·4	43·6	50·5	65·2	17 1 „	30·0	7 7 „	30·179	30·608	21 10 „	29·446	15 11 P.M.	·305
Nov. ...	45·5	50·1	39·8	45·0	58·7	13 NOON.	28·6	26 7 „	30·196	30·748	21 11 „	29·162	29 4 A.M.	·268
Dec. ...	40·7	45·1	35·6	40·4	55·1	16 „	21·8	25 7 P.M. 26 2 A.M.	29·957	30·666	22 10 „	29·032	10 11 P.M.	·220
Yearly Means	50·1	56·7	43·6	50·2	..	....	..	....	29·982	..	....	..	....	·294

* Reduced to 32° at M.S.L.

This table has been compiled at the Meteorological Office from values intended for publication in the volume of "Hourly Means" for 1897.

Meteorological Observations.—Table II.

Kew Observatory.

Months.	Mean amount of cloud (0=clear, 10=overcast).	Rainfall.*			Weather. Number of days on which were registered							Wind.† Number of days on which it was								
		Total.	Maximum.	Date.	Rain. ‡	Snow.	Hail.	Thunderstorms.	Clear sky.	Overcast sky.	Gales.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
1897.		ins.	ins.																	
January	7·5	1·930	0·645	8	18	8	..	..	3	19	..	9	5	4	2	3	..	5	3	4
February	8·2	2·185	0·725	4	13	..	..	..	4	20	..	2	2	4	2	2	9	4	3	5
March	7·4	3·610	0·540	2	19	2	3	1	2	19	5	2	3	..	1	3	10	10	2	1
April	7·2	1·315	0·285	27	13	..	..	1	1	14	..	4	6	3	2	5	5	2	3	2
May	5·7	1·135	0·280	30	12	..	..	1	8	8	..	5	6	..	1	3	8	4	4	1
June	6·7	2·535	0·815	8	12	..	..	2	4	13	..	3	5	4	1	6	4	3	4	5
July	5·3	0·935	0·625	19	5	..	..	2	8	6	..	4	4	3	..	1	8	7	4	6
August	6·3	2·620	0·640	31	17	..	..	1	4	10	..	..	3	2	1	4	16	5	..	2
September...	7·0	1·955	0·415	1	11	..	..	1	2	15	..	3	5	2	..	2	6	7	5	7
October	5·9	0·580	0·140	25	8	..	..	..	7	11	..	3	5	6	3	5	4	1	4	9
November...	7·3	0·895	0·320	27	9	..	..	..	2	19	1	2	7	7	..	2	9	1	2	8
December ...	6·2	2·140	0·510	7	18	..	..	1	5	9	3	3	1	6	1	5	10	4	1	6
Totals and means.	6·7	21·835			155	10	3	10	50	163	9	40	52	41	14	41	89	53	35	56

* Measured at 10 A.M. daily by gauge 1·75 feet above ground.

† As registered by the anemograph.

‡ The number of rainy days are those on which 0·01 inch rain or melted snow was recorded.

Meteorological Observations.—Table III.

Kew Observatory.

Months.	Bright Sunshine.				Maximum temperature in sun's rays. (Black bulb *in vacuo*.)			Minimum temperature on the ground.			Horizontal movement of the air.*		
	Total number of hours recorded.	Mean percentage of possible sunshine.	Greatest daily record.	Date.	Mean.	Highest.	Date. †	Mean.	Lowest.	Date. ‡	Average hourly velocity.	Greatest hourly velocity.	Date.
1897.	h. m.		h. m.		deg.	deg.		deg.	deg.		miles.	miles.	
January	36 42	14	5 24	26	59	94	25	29	18	18	11·6	34	23
February	42 12	15	8 0	18	73	105	27	35	18	18	10·3	32	25
March	123 42	34	10 24	19	98	118	23	32	16	30	14·5	39	3
April	144 6	34	12 30	15	106	125	29	32	17	11	13·1	34	23
May	260 0	54	14 54	22	119	131	31	36	25	13	11·8	31	21
June	190 30	38	15 24	12	124	143	24	47	34	17	9·5	28	8 26
July	261 36	53	14 48	15	127	136	3	47	31	8	8·9	32	13 14
August	220 42	49	12 54	4	129	141	5	47	37	13	10·8	29	17
September	124 36	33	10 24	3	110	128	25	43	31	19	8·8	33	1
October	99 30	30	8 12	3	95	118	16	37	24	7	8·0	29	16 17
November................	26 42	10	5 18	29	67	94	18	35	18	26	9·4	37	29
December................	44 42	18	5 36	11	62	85	15	30	18	4	13·5	43	29
Totals and Means	1575 0	32	..	..	97	..	..	37	..	..	10·8	..	..

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* As indicated by a Robinson's anemograph, 70 feet above the general surface of the ground, the original factor 3 being used.

† Read at 10 A.M., and entered to previous day. ‡ Read at 10 A.M., and entered to same day.

Table IV.

Summary of Sun-spot Observations made at the Kew Observatory.

Months.	Days of observation.	Number of new groups enumerated.	Days apparently without spots.
1897.			
January	12	7	—
February	7	6	—
March	19	5	1
April	14	6	3
May	20	6	5
June	16	2	4
July	16	7	—
August	15	6	—
September	15	7	—
October	12	3	6
November	10	4	3
December	9	5	—
Totals for 1897	165	64	22

APPENDIX III.—Table I.

RESULTS OF WATCH TRIALS. Performance of the 51 Watches which obtained the highest number of marks during the year.

Watch deposited by	Number of watch.	Escapement, balance spring, &c.	Mean daily rate.					Mean variation of daily rate. ±	Mean change of rate for 1° F.	Difference between extreme gaining and losing rates.	Marks awarded for			Total Marks.
			Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.				Daily variation of rate. 0—40	Change of rate with change of position. 0—40	Temperature compensation. 0—20	0—100.
			secs.	secs.	secs.	secs.	secs.	secs.	secs.	secs.				
Usher & Cole, London	29106	S.r., g.b., d.o, "Karrusel"	−3·1	−3·1	−3·3	−4·7	−3·6	0·3	0·05	5·5	33·4	38·1	16·9	88·4
A. E. Fridlander, Coventry	14358	S.r., g.b., s.o.,	+1·7	+1·9	−0·2	+1·3	+1·1	0·3	0·05	5·7	34·0	37·6	16·4	88·0
S. Yeomans, Coventry	73560	S.r., g.b., s.o., "Karrusel"	−1·4	−1·6	−1·6	−1·0	−3·0	0·4	0·04	3·0	31·8	37·9	17·6	87·3
Usher & Cole, London	29070	S.r., g b., s.o., "Karrusel"	+0·7	+0·1	+0·4	+0·5	−0·5	0·4	0·05	4·7	31·7	38·5	16·9	87·1
U. Montandon-Robert, Geneva	1076	D.r.,g.b., s.o.	+0·9	+1·3	+1·9	0·0	+2·1	0·4	0·03	3·8	31·3	37·4	18·2	86·9
Newsome & Co., Coventry	130196	S.r., g.b., s.o., "Karrusel"	+1·3	+3·1	+3·3	+4·1	+3·5	0·5	0·01	4·3	30·7	37·2	19·0	86·9
Carley & Co., London	50037	S.r., g.b., s.o., "Karrusel"	+2·4	+2·5	+2·7	+2·5	+2·6	0·5	0·04	4·3	29·5	39·7	17·1	86·3
U. Montandon-Robert, Geneva	1070	D.r.,g.b., s.o., bar-lever	+0·7	+2·1	+1·6	−0·3	+1·9	0·3	0·06	6·2	33·3	36·7	16·1	86·1
,, ,, ,, ,,	1069	D.r.,g.b., s.o., bar-lever	−2·8	−3·0	−2·4	−1·4	−1·1	0·4	0·04	3·8	31·5	37·2	17·3	86·0
A. E. Fridlander, Coventry	25521	S.r., g.b., s.o., "Karrusel"	−2·2	−2·6	−2·4	+0·8	+1·4	0·5	0·02	5·0	33·8	33·2	18·9	85·9
W. Matthews, Coventry	92277	S.r., g b., s.o., "Karrusel"	−1·0	−0·5	−0·7	−0·4	−1·0	0·4	0·09	5·5	32·6	39·0	14·0	85·6
S. Smith & Son, London	188–219 25532	S.r., g.b., s.o., "Karrusel"	+4·0	+2·5	+3·3	+1·8	+5·1	0·4	0·03	7·5	31·3	36·0	18·2	85·5
U. Montandon-Robert, Geneva	1073	D.r g.b., s.o., bar-lever	−0·6	+0·1	−0·7	−0·1	−2·2	0·4	0·05	3·7	31·2	37·6	16·7	85·5
Baume & Co., London	103038	"Tourbillon" chronometer, g.b., s.o.	+0·4	+0·5	−0·1	+3·3	+1·9	0·4	0·05	4·3	33·3	35·7	16·3	85·3
U. Montandon-Robert, Geneva	1071	D.r.,g.b., s.o., bar-lever	+3·3	+3·1	+0·6	+0·8	+3·2	0·4	0·02	5·7	31·4	34·8	19·0	85·2
,, ,, ,, ,,	1074	D.r.,g.b., s.o., bar-lever	−3·1	−2·5	−2·9	−2·0	−1·7	0·5	0·05	3·7	30·1	38·1	17·0	85·2
,, ,, ,, ,,	1086	D.r.,g.b., s.o. bar-lever	+0·1	−1·1	−1·7	−2·1	−0·5	0·5	0·05	5·8	30·9	37·3	16·9	85·1
A. E. Fridlander, Coventry	25518	S.r., g.b, s.o., "Karrusel"	+1·5	−1·6	+0·9	+0·3	+3·4	0·4	0·04	6·0	32·6	35·0	17·3	84·9
S. Smith & Son, London	20793	S.r., g.b., s.o., "Karrusel"	+1·6	+1·5	+1·0	−1·5	+2·6	0·5	0·02	6·5	30·4	35·8	18·6	84·8
T. Russell & Son, Liverpool	91043	S.r., g b., s.o., "Karrusel"	−1·6	−1·4	−1·1	+0·1	−1·6	0·5	0·06	4·7	30·8	38·1	15·8	84·7
S. Smith & Son, London	125317	S.r., g.b., s.o., "Karrusel"	+0·3	−0·3	−0·1	+1·3	+0·9	0·6	0·03	4·0	28·7	37·9	18·1	84·7
Williamson, Limited, London	54419	S.r., g.b., s.o., "Karrusel"	+3·8	+3·5	+3·3	+3·5	+5·3	0·5	0·06	6·0	30·7	37·7	16·2	84·6
Carley & Co., London	50182	S.r., g.b., s.o., "Karrusel"	+7·4	+6·0	+6·3	+6·7	+7·7	0·6	0·03	6·3	28·8	37·7	18·1	84·6
U. Montandon-Robert, Geneva	1047	D.r.,g.b., s.o., bar-lever	−2·2	−2·1	−2·0	−2·6	+0·9	0·5	0·02	5·2	29·8	36·0	18·6	84·4
A. E. Fridlander, Coventry	14414	S.r., g.b., s.o.	+3·0	+4·3	+3·2	−0·2	−0·2	0·4	0·01	6·0	32·3	32·7	19·3	84·3

Table I—*continued.*

Watch deposited by	Number of watch.	Escapement, balance spring, &c.	Mean daily rate.					Mean variation of daily rate. ±	Mean change of rate for 1° F.	Difference between extreme gaining and losing rates.	Marks awarded for			Total Marks.
			Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.				Daily variation of rate.	Change of rate with change of position.	Temperature compensation.	
											0—40	0—40	0—20	0—100.
			secs.	secs.	secs.	secs.	secs.	secs.	secs.	secs.				
A. E. Fridlander, Coventry	14393	S.r., g.b., s.o.	−0·1	+2·2	−2·1	+0·2	+2·0	0·4	0·04	6·2	31·9	34·7	17·6	84·2
A. E. Fridlander, Coventry	52886	D.r.,g.b., s.o.	+0·3	+0·5	+0·2	+2·2	+3·1	0·5	0·03	4·7	30·5	35·5	18·1	84·1
Newsome & Co., Coventry	125068	S.r., g.b., s.o., "Karrusel"	−1·0	−0·5	−0·5	+1·7	−0·1	0·5	0·04	5·0	29·5	37·0	17·6	84·1
Newsome and Co., Coventry	130351	S.r., g.b., s.o., "Karrusel"	+0·2	+1·7	+0·7	+3·4	+4·9	0·4	0·03	6·5	32·4	33·6	17·9	83·9
S. Smith & Son, London	20788	S.r., g.b., s.o., "Karrusel"	+2·2	+1·4	+2·3	+3·4	+4·4	0·4	0·05	4·2	31·0	36·4	16·5	83·9
Williamson, Limited, London	54417	S.r., g.b., s.o., "Karrusel"	−1·1	−1·3	−1·7	+1·0	+0·1	0·4	0·08	5·3	33·0	36·3	14·5	83·8
Newsome & Co., Coventry	129959	S.r., g.b., s.o., "Karrusel"	−2·6	−2·5	−1·8	−2·9	−2·3	0·6	0·04	5·5	27·9	38·8	17·1	83·8
A. E. Fridlander, Coventry	14333	S.r., g.b., s.o.	−0·1	+3·5	−0·7	+0·1	−2·4	0·4	0·04	7·0	32·0	34·6	17·1	83·7
H. Golay, London	2156	D.r.,g.b., d.o., chronograph	−1·0	+2·2	−0·7	+0·6	−0·3	0·5	0·03	4·5	29·7	36·0	18·0	83·7
W. Matthews, Coventry	92275	S.r., g.b., s.o., "Karrusel"	−1·1	−0·2	+0·6	+2·4	−1·0	0·4	0·07	5·7	32·5	35·6	15·4	83·5
Jos. White & Son, Coventry	35693	S.r., g.b., s.o.	+1·2	−2·1	−1·9	+0·4	+3·6	0·5	0·01	7·2	31·0	32·8	19·7	83·5
A. E. Fridlander, Coventry	25517	S.r., g.b., s.o., "Karrusel"	+4·3	+3·9	+4·9	+3·0	+4·6	0·4	0·10	7·0	32·3	37·7	13·4	83·4
Rotherham & Sons, Coventry	21777	S.r., g.b., s.o.	+1·4	+1·7	−1·8	+0·2	+2·7	0·4	0·04	8·0	31·4	34·9	17·1	83·4
Jos. White & Son, Coventry	35762	D.r.,g.b., s.o.	+0·7	+0·4	+1·8	+1·2	+1·6	0·5	0·08	5·8	30·8	38·1	14·5	83·4
Carley & Co., London	50170	S.r., g.b., s.o., "Karrusel"	−2·6	−3·4	−2·8	−2·4	−0·1	0·4	0·08	5·8	31·7	36·6	15·0	83·3
A. E. Fridlander, Coventry	25531	S.r., g.b., s.o., "Karrusel"	−3·1	−3·0	−3·1	−1·6	−1·5	0·6	0·04	4·5	28·8	37·1	17·3	83·2
S. Smith & Son, London	20798	S.r., g.b., s.o., "Karrusel"	+2·0	+2·3	+0·5	−1·0	+1·7	0·6	0·02	6·5	28·5	35·6	19·0	83·1
A. E. Fridlander, Coventry	14356	S.r., g.b., s.o.	+0·4	+2·4	+0·4	+1·1	−2·2	0·4	0·08	6·3	32·2	35·7	15·0	82·9
D. Buckney, London	30916	D.r.,g.b., s.o.	+1·5	−1·4	+0·6	+2·7	−0·6	0·5	0·04	5·7	30·4	35·0	17·4	82·8
Thomas Hill & Co., Coventry	$\frac{2950}{65838}$	S.r., g.b. s.o., "Karrusel"	+0·6	+1·2	+1·3	+0·9	+3·1	0·5	0·06	6·0	29·4	37·3	16·1	82·8
A. E. Fridlander, Coventry	25515	S.r., g.b., s.o., "Karrusel"	−5·8	−4·1	−5·2	−5·7	−0·7	0·5	0·02	7·2	30·1	34·0	18·6	82·7
C. J. H. Marlow, Coventry	20439	S.r., g.b., s.o., "Karrusel"	+1·4	+0·6	+1·5	−0·5	−0·6	0·6	0·04	7·0	28·4	36·8	17·5	82·7
S. Smith & Son, London	02222	D.r.,g.b., d.o., "non-magnetic"	−6·4	−5·6	−5·9	−3·4	−5·6	0·6	0·03	9·0	27·7	36·8	18·2	82·7
Jos. White & Son, Coventry	35417	S.r., g.b., s.o.	−0·6	−1·7	−1·3	−3·2	−3·4	0·4	0·07	7·5	31·6	36·0	15·0	82·6
S. Yeomans, Coventry	76149	S.r., g.b., s.o., "Karrusel"	−0·9	−0·3	−0·9	−0·1	+3·9	0·5	0·02	6·5	29·5	34·2	18·8	82·5
Baume & Co., London	12025	S.r., g.b., s.o., "Karrusel"	+3·8	+3·1	+4·0	+1·1	+3·5	0·6	0·04	10·7	28·2	36·8	17·5	82·5

In the above List, the following abbreviations are used, viz. :—s.r. for single roller; d.r. for double roller; g.b. for going barrel; s.o. for single overcoil; d.o. for double overcoil; + for gaining rate; − for losing rate.

Table II.

Highest Marks obtained by Complicated Watches during the year.

Description of watch.	Number.	Deposited by	Marks awarded for			Total marks,
			Variation.	Position.	Temperature.	
			0—40	0—40	0—20	0—100.
Minute chronograph and minute repeater	52944	Fridlander, Coventry	31·0	33·4	14·4	78·8
,, ,, ,,	2203	J. W. Benson, London	28·3	27·9	17·5	73·7
,, ,, ,,	35574	J. White and Son, Coventry	19·7	34·8	16·2	70·7
,, ,, ,, (and split seconds)	152–1	S. Smith and Son, London	24·4	30·4	15·7	70·5
Minute and split seconds chronograph	167726	Stauffer, Son, and Co., London	29·4	35·8	13·4	78·6
,, ,, ,,	64681	Golay, London	24·7	34·6	17·1	76·4
,, ,, ,,	159–1899	S. Smith and Son, London	28·8	31·0	16·0	75·8
,, ,, ,,	3364	Baume and Co., London	27·0	32·2	13·5	72·7
Minute and seconds chronograph	2156	Golay, London	29·7	36·0	18·0	83·7
,, ,, ,,	246980	Baume and Co., London	28·8	33·4	19·3	81·5
,, ,, ,,	3029	,, ,,	26·5	37·2	16·1	79·8
,, ,, ,,	29817	Usher and Cole, London	29·6	32·3	16·5	78·4
Minute repeater	52952	Fridlander, Coventry	30·0	30·6	14·9	75·5
,, ,, (and calendar)	19750	Oram and Son, London	17·3	32·2	17·2	66·7
"Non-magnetic"	02222	S. Smith and Son, London	27·7	36·8	18·2	82·7
,,	14194	Fridlander, Coventry	30·5	33·4	16·8	80·7